REMARKS

Claims 1-4 are pending and remain for consideration. Claims 1-3 are amended herein.

The Abstract of the Disclosure is objected to for being too long. The Abstract of the Disclosure is amended herein in order to be in the range of 50 to 150 words. It is therefore respectfully submitted that the objection to the Abstract of the Disclosure is overcome.

Claims 1-3 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as allegedly being unpatentable over claims 1 and 2 of copending Application No. 10/357,023. The rejection is traversed and reconsideration is respectfully requested.

Application No. 10/357,023 discloses and claims a method for determining optimum bond parameters for bonding with a Wire Bonder. The method of claim 1 comprises the following steps:

a) Carrying out several bonding operations, with which an end of a wire formed into a ball is bonded onto a connection point, whereby the bond force F_B and the ultrasonic variable P are each varied in discrete steps in a predefined range, whereby during bonding, for each bonding operation an electrical signal is produced by means of a sensor which signal is proportional to a shear force exerted on the corresponding connection point,

b) for each bonding operation, determining a quantity G from the electrical signal delivered by the sensor during the bonding operation,

c) Determining a maximum value of the quantity G and corresponding values for the bond force F_B, the ultrasonic variable P or determining a global maximum of the quantity G and determining corresponding values for the bond force F_B, the ultrasonic variable P or determining a range H for the quantity G in which the quantity G fullfils predefined criteria and determining a value for each of bond force F_B, ultrasonic variable P which lie in the range H.

Amended claim 1 of the present application claims the following method:

Method for determining optimum bond parameters including a bond force F_B and an ultrasonic variable P_B of a Wire Bonder for a bond process, whereby for this determination a number of bond cycles are carried out, whereby for each bond cycle a wire connection is made between a connection point of a semiconductor chip and a connection point of a substrate in that a wire end protruding out of a capillary is melted into a ball and then, in a bond position, the wire ball is attached to the connection point of the semiconductor chip, then the wire pulled through to the required length, formed into a wire loop and attached to the connection point of the substrate, and whereby the bond parameters to be optimized are each varied in discrete steps within a predefined range, wherein with each bond cycle n, after attaching the wire ball to the connection point of the semiconductor chip, the following steps are carried out:

a) Applying a predetermined bond force F_{Bn},

b) Moving the capillary out of the bond position in a predetermined direction whereby the current $I_n(t)$ flowing through the drive which moves the capillary is monitored in the course of time t,

c) Stopping the capillary as soon as the current $I_n(t)$ decreases,

d) Determining a maximum of the current $I_{n,max}$ from the progression of the current $I_n(t)$ established during steps b) and c),

and wherein from the values $I_{n,max}$ established with the n bonding processes those values for the bond parameters are determined as optimum bond parameters for which the current $I_{n,max}$ reaches a maximum.

The two methods are distinct for the following reason:

With the method of Application No. 10/357,023 the quantity G is determined from the signal of the sensor delivered during the bonding operation, i.e. during

attaching the wire ball to the connection point of the semiconductor chip. The quantity G is used as an indicator for the strength of the bond connection.

With the method of the present application as recited in amended claims 1-3, first the wire connection is made and then in a subsequent second step - after attaching the wire ball to the connection point of the semiconductor chip - the strength of the bond connection is measured using the capillary as a shear tool.

Consequently, the steps a), b) and c) of the '023 method and the steps a), b), c) and d) of the method of the present application are completely different as the '023 method teaches a sequence of method steps to be performed during the bonding process whereas the present application teaches a sequence of method steps to be performed after the bonding process. Accordingly, the obviousness-type double patenting rejection is improper and should therefore be withdrawn.

Claims 1-10 are rejected under 35 U.S.C. § 112, second paragraph as allegedly being indefinite. The rejection is traversed and reconsideration is respectfully requested, particularly in view of the clarifying amendments to the claims. There are only four claims pending in the present application. Accordingly, it will be assumed for the purpose of responding to the rejection that the Examiner meant to reject claims 1-4.

Claims 1 and 2 have been amended to remove the objected to phrases. Accordingly, it is respectfully submitted that the § 112, second paragraph rejection is overcome.

Claims 1-4 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Asanasavest (U.S. Pat. No. 5,230,458). The rejection is traversed and reconsideration is respectfully requested, particularly in view of the clarifying amendments to the claims.

Asanasavest provides a real time feedback interconnect system which allows real-time detection and control of bond force exerted on the bond site. A force sensor is provided in the bond system, which detects the bond force exerted by the bond tool. The force sensor provides a force signal to a real-time feedback circuit. The feedback circuit transmits a force adjustment signal to a z-motion actuator to adjust the force applied to the bond site.

Asanasavest is directed to a method for maintaining the bond force at a predetermined level during the bonding process. This method uses a force sensor for in situ detecting the bond force and a feedback circuit coupled to receive the force signal for providing in response thereto an adjustment signal to a damper.

In contrast, the claimed invention concerns a method for determining optimum bond parameters wherein after attaching the wire ball to the connection point of the semiconductor chip, the following steps are carried out:

a) Applying a predetermined bond force F_{Bv},

b) Moving the capillary out of the bond position in a predetermined direction whereby the current $I_n(t)$ flowing through the drive which moves the capillary is monitored in the course of time t,

c) Stopping the capillary as soon as the current $I_n(t)$ decreases,

d) Determining a maximum of the current $I_{n,max}$ from the progression of the current $I_n(t)$ established during steps b) and c),

and wherein from the values $I_{n,max}$ established with the n bonding processes those values for the bond parameters are determined as optimum bond parameters for which $I_{n,max}$ reaches a maximum.

Asanasavest does not teach that any steps be performed after attaching the wire ball to the connection point of the semiconductor chip. A claim is anticipated

only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.[1]

For at least the above-identified reasons, Asanasavest does not disclose each and every element in Applicants' amended claims 1-4. Therefore, amended claims 1-4 are not anticipated by Asanasavest and the rejection of claims 1-4 under 35 U.S.C. § 102(b) should be withdrawn and claims 1-4 allowed.

Claims 1-4 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Guez (U.S. Pat. No. 5,832,412). The rejection is traversed and reconsideration is respectfully requested, particularly in view of the clarifying amendments to the claims.

Guez is directed to a digital programmable ultrasonic generator for driving an ultrasonic transducer that includes a computer for receiving and storing a plurality of selectable programs. The programs are indicative of different modes of operation. A profile generator is coupled to the computer to receive programs and to produce a digital reference voltage indicative of a voltage profile to be generated for the mode selected. A digital frequency controller is coupled to a direct digital synthesizer for producing a predetermined frequency in response to a programmed frequency command from the computer. A process controller receives the output of the direct digital synthesizer as a voltage signal having the desired frequency and modifies the voltage depending on the mode of operation and voltage desired before driving a power amplifier coupled to the transducer to be driven.

---

[1] Manual of Patent Examining Procedure (MPEP) § 2131. See also *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Guez concerns an ultrasonic generator that overcomes prior art problems by first characterizing the actual bonding system before starting bonding operations. This characterization of the bonding operation permits the operating personnel to select a mode of operation that will assure desired results. Pre-bonding tests are employed to identify the frequency, force, current, voltage or power that produces the best and strongest and fastest bond at both first and second bonds using the generator and transducer which will be used to perform the production operation. Having determined the bonding operation parameters to be used in production by a series of uniform tests, the invention permits the operator to program the optimum parameters into a host computer of an automatic wire bonder which automatically adjusts the desired control parameters during an actual wire bonding operation.

Guez does not disclose that after attaching the wire ball to the connection point of the semiconductor chip, any further steps are carried out and especially not the following steps:

a) Applying a predetermined bond force F_{Bi},

b) Moving the capillary out of the bond position in a predetermined direction whereby the current $I_n(t)$ flowing through the drive which moves the capillary is monitored in the course of time t,

c) Stopping the capillary as soon as the current $I_n(t)$ decreases,

d) Determining a maximum of the current $I_{n,max}$ from the progression of the current $I_n(t)$ established during steps b) and c),

and wherein from the values $I_{n,max}$ established with the n bonding processes those values for the bond parameters are determined as optimum bond parameters for which $I_{n,max}$ reaches a maximum.

According to the Manual of Patent Examining Procedure (M.P.E.P.),

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure.[2]

Guez does not teach or suggest the above listed steps a) to d). The basic criteria required to establish a prima facie case of obviousness are therefore not met by Guez in order to render obvious claims 1-4. Especially, the teaching of Guez must be viewed without reading the application's teachings into the reference which is an impermissible hindsight reconstruction to arrive at the claimed invention. For at least the above-identified reasons, the Guez reference does not teach or suggest each and every element in Applicants' amended claims 1-4. Therefore, amended claims 1-4 are not obvious in view of Guez, and therefore the rejection of claims 1-4 under 35 U.S.C. § 103(a) should be withdrawn and claims 1-4 allowed.

In view of the foregoing, it is respectfully submitted that claims 1-4 are in condition for allowance. All issues raised by the Examiner having been addressed, an early action to that effect is earnestly solicited.

---

[2] M.P.E.P § 2143.

No fees or deficiencies in fees are believed to be owed. However, authorization is hereby given to charge our Deposit Account No. 13-0235 in the event any such fees are owed.

Respectfully submitted,

By Daniel G. Mackas
Daniel G. Mackas
Registration No. 38,541
Attorney for Applicants

McCORMICK, PAULDING & HUBER LLP
CityPlace II, 185 Asylum Street
Hartford, CT 06103-3402
(860) 549-5290